2.1.1.7 Climatology: Precipitation and Temperature

As stated previously, the subbasin begins in the high mountains of the Northern Basin and Range geologic province to the south and reaches northward to the lowlands of the Snake River Basin High Desert. Because of the elevation difference across the subbasin, there are pronounced differences in climate from the Snake River Plain to the mountains. Precipitation varies from 8 to 9 inches/year on the lower elevations of the Snake River Plain to 22 to 42 inches/year on the mountain summits (Figure 13). Using the Koeppen system of climate classification, the plains would be classified as BSk or "cold steppes" and the mountains as "undifferentiated highland climates."

Only two climate stations from the Western Regional Climate Center (www.wrcc.dri.edu 2000) are available to characterize the watershed. These are Bruneau and Three Creek. A third, Grassmere, is not available at this time. As a result, there are few data sets available for the bulk of the middle section of the subbasin. As noted, nearly all the perennial flow in this watershed comes from the mountains to the south of the Snake River Plain which do not have climate station data.

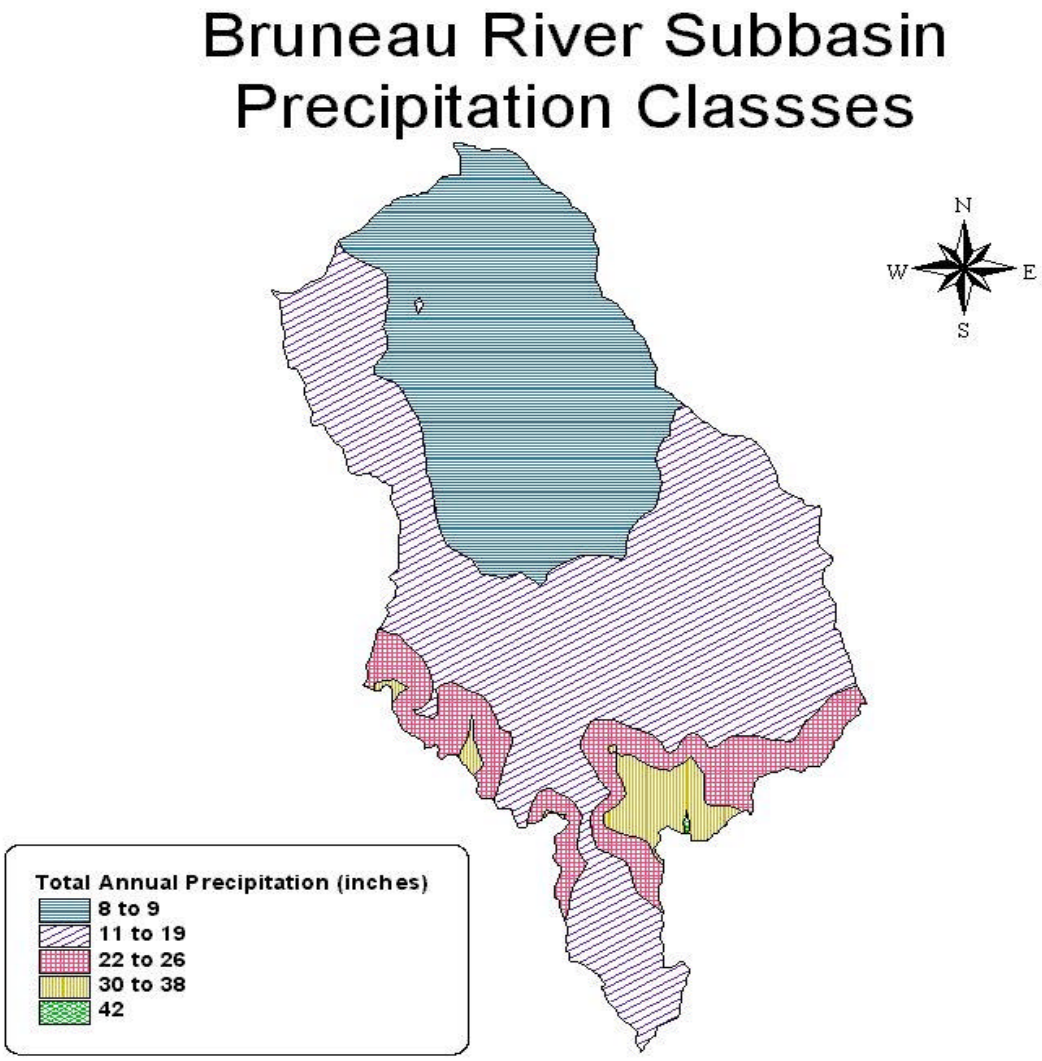
The town of Bruneau is in the southwestern portion of the Snake River Plain at approximately 771 m elevation. The climate is arid with an annual precipitation of 19.28 cm. Over one-fourth the precipitation falls as snow in November to March. Average snow depths in these months is zero, indicating that most precipitation in the form of snow does not accumulate to provide for a spring snowmelt runoff. The wettest months of the year are November and January (2.51and 2.29 cm respectively), while the driest months are July through October (0.46 to 1.24 cm). For the remainder of the year, the mean precipitation is evenly distributed at approximately 1.79 cm a month. The annual temperature is 11.39 $^{\circ}$C, with average winter temperatures of 0.83 $^{\circ}$C, and average summer temperatures of 22.28 $^{\circ}$C.

The town of Grassmere is approximately 64 km south and west of Bruneau in the Snake River plain ecoregion. Grassmere lies at an elevation of 1,563.62 m. It is an arid climate, with an annual mean precipitation of approximately 20-23 cm. The annual temperature is between 7.33 and 9.66°C, with cool winters and warm summers (Figures 14 and 15)

The third permanent weather station is located at Three Creek, and is the closest station to the mountainous area. It lies at the edge of the Snake River Plain at an elevation of 1,652 m. The area is semi-arid with an annual mean precipitation of 32.84 cm, about a third of this as snow. Average snow depths in the winter months ranges from 7.62 to 10.16 cm, indicating that some precipitation in the form of snow accumulates to provide for a spring snowmelt runoff. The wettest months of the year are May and June (4.65 and 4.47cm respectively), while the driest months are July and August (1.32 and 1.4 cm). For the remainder of the year, the mean precipitation is evenly distributed at around 2.54 cm a month. The annual temperature is 6.33°C, with average winter temperatures of –2.33 $^{\circ}$C and average summer temperatures of 15.94 $^{\circ}$C.

2.1.2 Subbasin Hydrology

Generally, the natural hydrology of an area is related to its climactic regime, topography, and geology. Water in the Bruneau River Subbasin moves through a variety of pathways, dominated by the Bruneau River and Jarbidge River routes. Except for the two mountainous southern drainages, most of the surface channels are intermittent or ephemeral tributaries. Seasonally, groundwater plays an unknown but significant role in the hydrology of several streams and rivers of the subbasin.

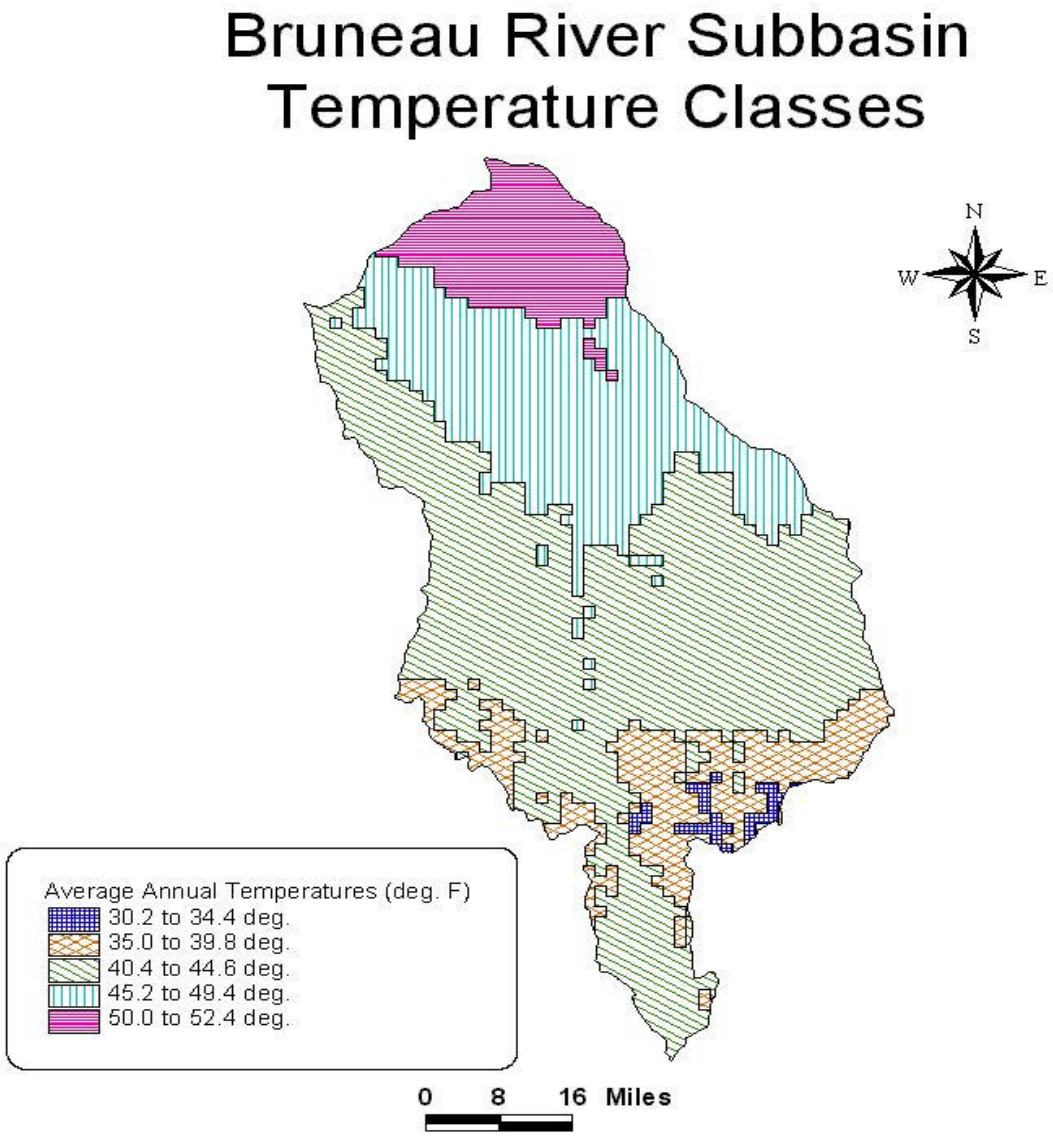


Precip. (in	Acres	Square Mil	% of Area
8 to 9	736362.540	1150.560	34.7
11 to 19	1095828.350	1712.220	51.6
22 to 26	221841.480	346.630	10.5
30 to 38	67611.070	105.630	3.2
42	737.620	1.150	0.0

Prepared by Rob Sharpnack - March 2000

Source: Upper Snake Basin Ecological Classification Nov. 1999

Figure 13. Annual Precipitation Ranges of the Bruneau River Subbasin.



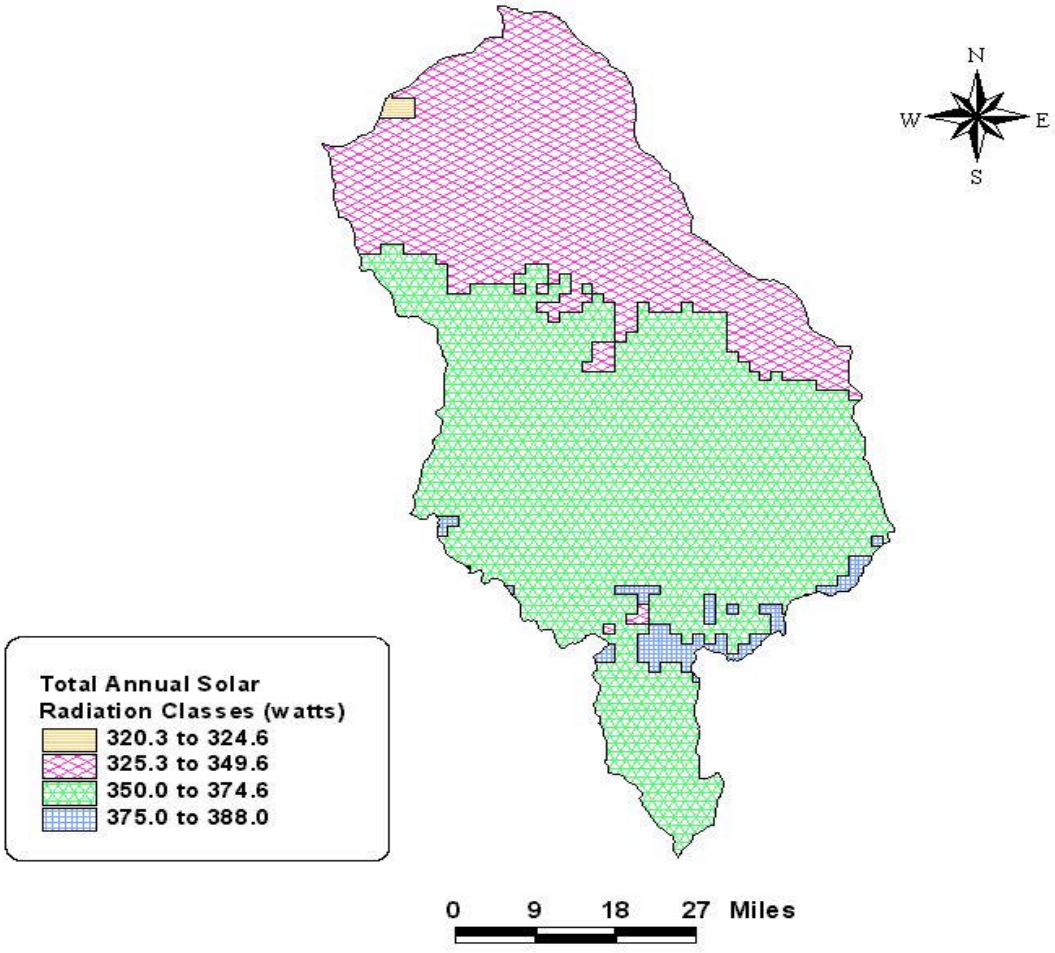
Classes	Acres	Square Miles	% of Area
30.2 - 34.4	25575.8700	39.8900	1.2
35.0 - 39.8	246283.6200	384.4800	11.6
40.4 - 44.6	1116752.1000	1744.4200	52.6
45.2 - 49.4	524709.8200	819.6000	24.7
50.0 - 52.4	209070.7400	325.6300	9.9

Prepared by Rob Sharpnack - March 2000

Source: Upper Snake Basin Ecological Classification Nov. 1999

Figure 14. Average Annual Temperature Ranges of the Bruneau River Subbasin.

Bruneau River Subbasin
Solar Radiation Classses



Class	Acres	Square Miles	% of Area
320.3 to 324.6	5742.4400	8.9500	0.3
325.3 to 349.6	772232.3200	1204.8000	36.4
350.0 to 374.6	1290141.6100	2012.6700	60.8
375.0 to 388.0	54274.9900	84.6300	2.6

Prepared by Rob Sharpnack - March 2000

Source: Upper Snake Basin Ecological Classification Nov. 1999

Figure 15. Total Annual Solar Radiation of the Bruneau River Subbasin.

2.1.2.1 Bruneau River

The Bruneau River begins in the northeastern mountains of Nevada and flows to the confluence of the Snake River at CJ Strike Reservoir (see section 2.1.1). Throughout its 133.58 kilometer length (Idaho portion), three perennial tributaries (Sheep Creek, Jarbidge River, and Clover Creek) enter the system as do numerous intermittent and ephemeral systems. Three gauge locations can be found on the Bruneau River in Idaho. The upstream most of these locations is the gauge near Tindall, Idaho. The Tindall gauge was in operation from August 1910, until May 1912, with a contributing watershed area of 1139.6 km^2. Given this size watershed, channel characteristics can be extrapolated from regional curves. These regional curves can be found in the book *Applied River Morphology* (Rosgen 1996). Extrapolating from the regional curve, the Bruneau River at this sampling location would have a mean depth of 1.07 m, a bank full width of 24.38 m and a cross sectional area of approximately 27.87 m^2. From the historical gauge data, period of record average discharge at this location was 3.35 cubic meters per second (cms). Low discharge occurred during the fall quarter with only 0.70 cms. Spring discharge was 8.58 cms, while winter base discharge was 1.48 cms. Summer discharge was 2.30 cms.

The next gauge was located near Winter Camp Ranch. The period of record for this gauge was from November 1946 to September 1951. The watershed area for this gauge was 4,895 km^2. The average discharge at this gauge was 9.94 cms. The lowest average discharge occurred again in the fall at 1.80 cms. Winter base discharge averaged 3.94 cms, while during the summer the average discharge was 12.98 cms.

The final gauge location is near Hot Springs, Idaho. This location is also the beginning of the 23.24 km long §303(d) listed section of the Bruneau River. Additionally, this gauge is the only active gauge on the Bruneau River in Idaho. The period of record for this gauge is from July 1909 to February 1915 and from October 1943 to September 1998. The drainage area of the contributing watershed is 6811.68 km^2. The average discharge is 10.98 cms. Average spring discharge is 23.35 cms. Winter discharge averages 4.73 cms. Low discharge occurs in the fall and averages 2.88 cms (Figure 16).

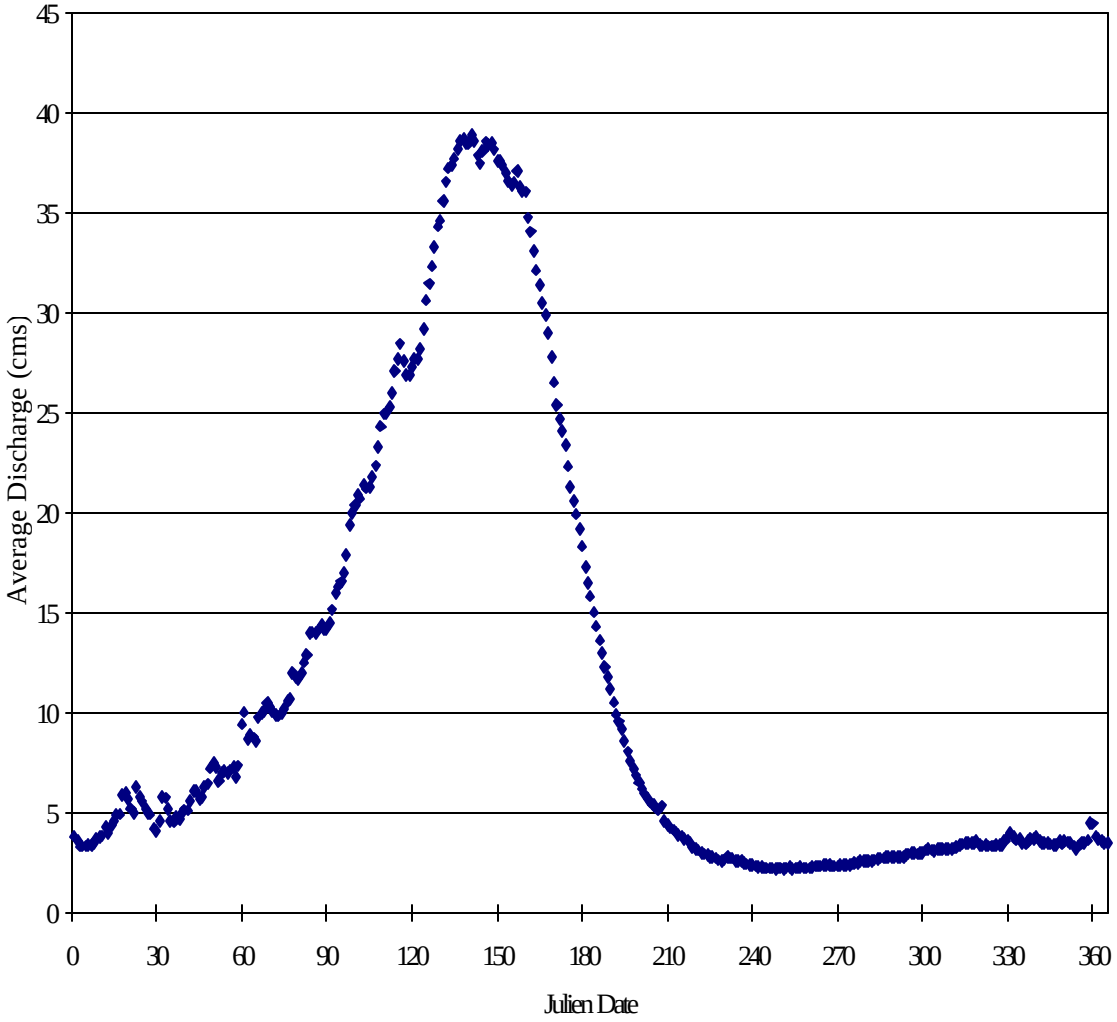


Figure 16. Daily Average Discharge for the Bruneau River, Hot Springs, Idaho Gauge.

It is unknown at this time as to the quantity of groundwater interchange in the area between the Hot Springs gauge and the mouth of the river. This area of the Bruneau River overlies the Bruneau-Grandview aquifer, so interchange to and from the river with geothermal waters does occur. Public comments received during presentations in the Bruneau area indicate that at times of the year the majority of discharge in the river is from the geothermal sources. It was indicated that geothermal waters from springs in the river near Hot Springs and large springs further up the Bruneau River canyon make up a large part of the discharge. A strong seasonal component was also indicated. Snowmelt and other runoff events in the early spring cool the river. By late spring through early fall the springs are responsible for a greater percentage of the discharge. The river is again cooled by early winter storms and runoff events.

2.1.2.2 Jacks Creek

Jacks Creek begins at the confluence of Big Jacks Creek and Little Jacks Creek. The creek is 19.81 km in length. No perennial streams enter Jacks Creek below the confluence of Big and Little Jacks Creeks. The Sugar Valley Wash, an ephemeral stream, joins Jacks Creek approximately 3.22 km above the mouth of Jacks Creeks. Jacks Creek itself is not gauged, but two gauges can be found at or near the mouths of the tributaries Big and Little Jacks Creek. Two final sources of water add to the discharge in Jacks Creek to an unknown extent. These sources are hot spring water effluent from a warm water fish hatchery and agriculture wastewater from field runoff and flowing wells. Water from these sources enters Jacks creek beginning approximately 8.05 km from the mouth. In many cases, the runoff from the agricultural fields is from geothermal wells used for irrigation. For example, a farmer in the Jacks Creek drainage noted that water from his irrigation well was applied to his fields at or near 41EC.

The upper 11.27 km of Jacks Creek is also dry for most of the year as can be seen by looking at the Big Jacks Creek Gauge data. The Big Jacks gauge period of record runs from 1938 to 1949 and from 1966 to 1998. The contributing watershed is 655.27 km^2. During the period of record, the average discharge was 0.14 cms and the average spring discharge was 0.37 cms. Winter discharge averaged 0.11 cms while summer discharge averaged 0.06 cms. Low discharge occurs in the fall and averaged 0.03 cms. The gauge was also prone to long periods of zero discharge (Figure 17). For example, in water year 1998, Big Jacks Creek was dry from October 1, 1997 until January 12, 1998, from January 22 until March 16, 1998 and from July 16 to September 5, 1998.

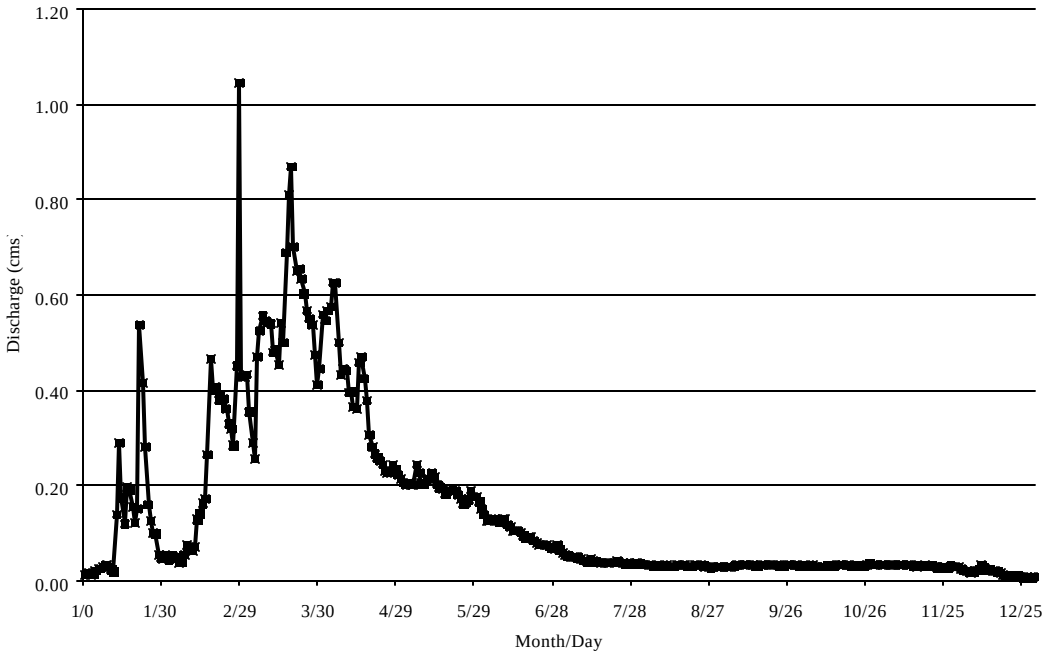


Figure 17. Daily Average Discharge in Jacks Creek.